Title:	**Sturgeon Classification**
Subject:	Classification and dichotomous keys
Author:	Rob Yeomans
Grade Level:	High School
Time Duration:	One 90 minute block or two 45 minute periods
Overview:	Students will use pictures of 7 members of the order Acipenseriformes to build a dichotomous key to identify each species.
Objectives:	Students will be able to: • Describe how to construct a dichotomous key • Explain the hierarchal grouping of taxonomy • Define a species • Use their observational skills to differentiate species of sturgeon • Understand the human impact on many species of sturgeon
Materials:	• Whiteboard • Projector and screen • Dichotomous key assignment
Procedure:	1. At the start of class, put the KPCOFGS of Atlantic sturgeon on the board, out of order. Have the class put each category in order from biggest to smallest and then define each term (What does it mean to be in kingdom Animalia? Phylum Chordata?) If the students don't know, tell them—especially when you get down to order, family and genus. • Kingdom Animalia (multicellular, heterotrophic, eukaryotic) • Phylum Chordata (have at some point a notochord, dorsal nerve cord, gill slits and a post-anal tail) • Class Actinopterygii (All ray finned fishes. Fins are made of bony spines connected by a webbing of skin for support) • Order Acipenseriformes (primitive, cartilaginous endoskeleton, lack of a vertebral column) • Family Acipenseridae (true sturgeon; elongated bodies, lack of scales, anadromous, bottom feeders) • Genus <u>Acipenser</u> (Atlantic Sturgeon) • Species <u>oxyrinchus</u> Comment to the class that there are actually two subspecies of oxyrinchus. <u>Acipenser oxyrinchus oxyrinchus</u> is the Atlantic sturgeon and <u>Acipenser oxyrinchus desotoi</u> is the Gulf sturgeon 2. Reinforce the fact that sturgeon are a primitive fish and fossils have been found dating back 144-65 million years ago. 3. Ask the students to define a species. Write their responses on the board.

	The teacher should take their responses to write the most agreed upon definition (morphology and producing fertile offspring). 4. Pass out the dichotomous key assignment and put it on the movie screen using the projector. Have the students read the introduction and, as a class, build the dichotomous key for writing utensils. Here's one way to do it. 1a. utensil is made of wax ……crayon 1b. not as above ……go to 2a 2a. utensil uses lead ……go to 3a 2b. not as above ……go to 4a 3a. utensil has gray lead ……pencil 3b. utensil has colored lead ……colored pencil 4a. utensil has a fine tip and uses ink ……pen 4b. utensil has a broad tip and uses ink ……magic marker 5. Have them look at the parts of a typical sturgeon and then at the seven different members of the order. Have one student read the introduction to this part of the assignment. As a class, create the first set of opposite statements and identify one of the species. For example: 1a. fish has a long extension of upper part of caudal fin . . . shovelnose 1b. fish not as above . . . . . go to 2a 2a. fish has-- 2b. fish not as above . . . . . .go to 3a 6. Then, in groups of two, have them work on the sturgeon. Teacher should move around the room, helping those groups who are having trouble. Their homework is to finish the key and do the two post questions at the end of this assignment.
Conclusion	During the next class, ask the students to explain the population status of a fish they chose and any human uses for this species. The class should come to the conclusion that many of these fish species have been fished for their roe. Finally, ask the class why all organisms have a scientific name and a common name. Why do scientists use scientific names? (Common names vary with geography, language, do not accurately describe the organism and sometimes one common name can be used for a multitude of organisms).
Massachusetts Frameworks	5.2 Describe species as reproductively distinct groups of organisms. Recognize that species are further classified into a hierarchical

	taxonomic system (kingdom, phylum, class, order, family, genus, species) based on morphological, behavioral, and molecular similarities. Describe the role that geographic isolation can play in speciation.

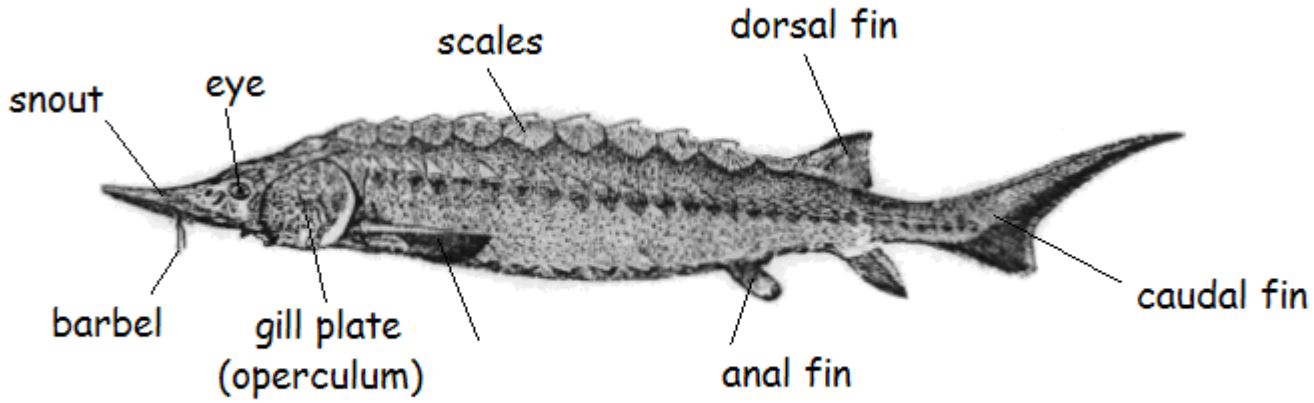
Classification

Dichotomous Keys

A dichotomous key is a means of discovering the name of an unknown organism based on its morphology. It presents the user with a set of paired characteristics that are opposite each other. The user must choose the characteristic that best fits the unknown organism and follow the directions for the proper characteristic until a name is the last choice; thereby, this "key" unlocks the name of an unknown. There are keys for all varieties of organisms. Keys can be built for non-living items as well. Below is a list of five writing utensils. Construct a key for these items:

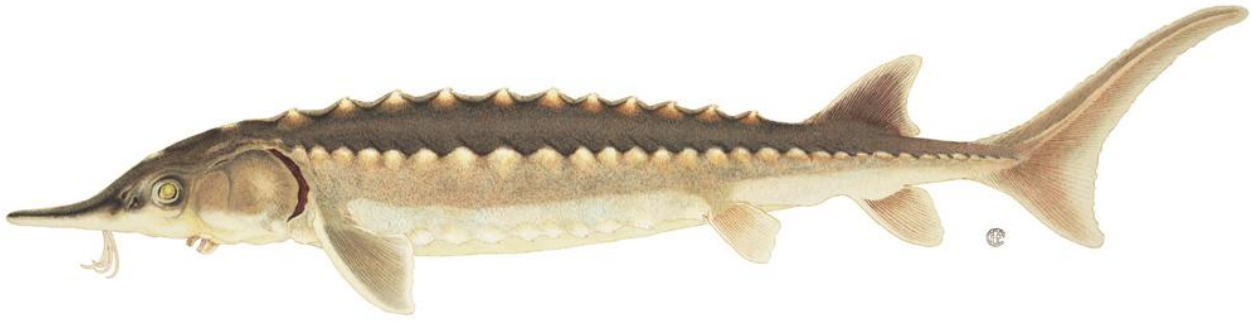
Pen, crayon, pencil, magic marker, colored pencil

Now that you have the idea of building a dichotomous key, let's build one for sturgeon. Here's a picture of a typical sturgeon and some of its morphological characteristics.



Below are seven different species that all belong to the order Acipenseriformes. They all have similar characteristics but belong in different species. Create a dichotomous key for these fish. Use adjectives to describe the morphological differences between each species. You can build this dichotomous key using no more than 7 sets of statements but if you need more, that will do as well. Your finished key should be typed and handed in at the end of next class.

Atlantic Sturgeon



http://pond.dnr.cornell.edu/nyfish/Acipenseridae/atlantic_sturgeon.jpg

Lake Sturgeon

http://pond.dnr.cornell.edu/nyfish/Acipenseridae/lake_sturgeon.jpg

Shortnose Sturgeon

http://pond.dnr.cornell.edu/nyfish/Acipenseridae/shortnose_sturgeon.jpg

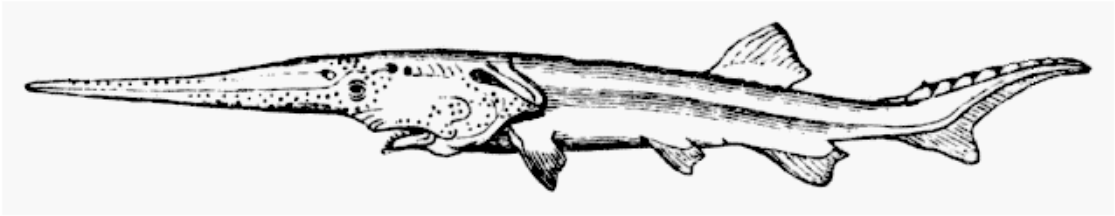
Shovelnose

http://www.landbigfish.com/images/fish/ShovelnoseSturgeon.jpg

American Paddlefish

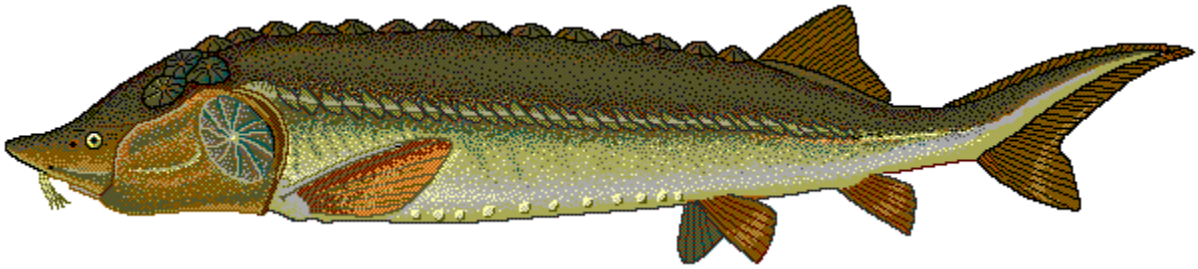
http://animaldiversity.ummz.umich.edu/site/resources/Grzimek_fish/Acipenseriformes/Polyodon_spathula.jpg/badge.jpg

Chinese Paddlefish



http://upload.wikimedia.org/wikipedia/commons/e/ee/Psephurus_gladius.png

Beluga Sturgeon



http://upload.wikimedia.org/wikipedia/commons/e/e7/Beluga_sturgeon.png

Post Questions.

1. What is the scientific name for each species?

Atlantic _____

Lake _____

Shortnose _____

Shovelnose _____

American paddlefish _____

Chinese paddlefish _____

Beluga sturgeon _____

2. Research one sturgeon in terms of its current location, habitat, population status, historical population status, and human usage. Identify two factors attributed to the current population status. Your response should be one paragraph.

_____
_____
_____
_____
_____
_____
_____

3. Choose a different marine fish and research its classification from Kingdom to species. List them below, with their meaning.

Kingdom_____

Phylum_____

Class _____

Order _____

Family _____

Genus _____

Species_____